SNOWPLOWABLE RAISED PAVEMENT MARKERS MSP-01-06A

1.0 INSTALLATION OF SNOWPLOWABLE RAISED PAVEMENT MARKERS

1.1 Description. This work shall consist of furnishing and installing permanent snowplowable raised pavement markers (SRPM) as shown on the plans or as directed and approved by the engineer. The SRPM's shall consist of an iron casting to which is attached a replaceable retroreflector for reflecting light longitudinally along the pavement from one or two directions as specified.

1.2 Materials.

1.2.1 Casting. The durable metal base casting shall be shaped to deflect a snowplow blade upward and prevent damage to the reflectors. The casting shall have leveling tabs to ensure proper embedment and shall be fastened to the road surface by an epoxy adhesive. The casting shall be designed for bi-directional plowing and shall be recyclable. The bottom surface of the casting shall be free of scale, dirt, rust, oil, grease or any other contaminant that might reduce bonding to the epoxy adhesive. SRPM's shall be pre-approved prior to installation.

1.2.2 Reflector. The reflector shall have one or two retroreflective lenses to reflect incident light from a single direction or from opposite directions. The lens shall be hermetically sealed and permanently bonded to the reflector base. The manufacturer's trademark shall be molded in the face of the reflector lens or on the reflector body so as to be visible after installation.

1.2.2.1 The reflector shall have nominal dimensions of 2.0" (50 mm) X 4.0" (100 mm) by 0.5" (12.7 mm). The reflector shall fit securely into a recessed area on the upper surface of the casting web. After installation, the reflector shall fit securely in the recessed area and shall not protrude above the profile of the casting. The reflective surface of each lens face shall be a minimum of 1.55 square inches (1000 mm^2) in area.

1.2.2.2 Prior to the placement of the markers, the reflector shall be attached to the casting in accordance with the manufacturer's recommendations. Care shall be taken to ensure no adhesive is on the reflective lens.

1.2.3 Epoxy Adhesive. The epoxy adhesive used to bond the SRPM to the pavement shall be in accordance with the manufacturer's recommendations. The epoxy adhesive shall be machine mixed and applied unless otherwise approved by the engineer. The machine mixer and applicator shall be capable of accurately and uniformly proportioning the components. The mixing chamber shall produce an epoxy adhesive of uniform color with no visible evidence of streaks on the surface or within the mixed epoxy adhesive.

1.3 Construction Requirements. SRPM's shall be installed in accordance with the following requirements.

1.3.1 Markers shall not be installed when the ambient temperature is below 50 F (10 C), the relative humidity is above 80 percent or the pavement surface is wet.

1.3.1.1 Newly placed bituminous pavement surfaces shall be allowed to cure for a minimum of seven days prior to installing the markers. Working days will not be assessed against the

contractor if pavement curing for newly placed bituminous pavement extends beyond the working days established for the contract, providing the contractor continuously and diligently prosecutes the work to completion as soon as the curing and temperature requirements can be met.

1.3.2 Markers shall be installed as shown on the plans or as directed by the engineer. A longitudinal adjustment to the location of the marker shall be made in order to avoid damage to deteriorated pavements or transverse joints. In locations where concrete and bituminous surfaces abut, the SRPM shall be installed in the concrete surface.

1.3.3 The pavement shall be accurately cut to the SRPM manufacturer's specifications. The pavement shall be cut to match the bottom contour of the marker. The entire cut shall be made in a single plunge. Multiple saw cuts to create a slot will not be allowed.

1.3.3.1 The contractor shall check the slot for proper fit using a marker. The marker shall fit easily within the cut with the leveling tabs resting on the pavement and marker tips slightly below the pavement surface. If any force is required to place or remove the marker, or if the leveling tabs do not rest on the pavement surface, the cut shall be modified as necessary.

1.3.3.2 If necessary, installations on crowned pavements, superelevated pavements or ramps shall be cut deeper to provide proper marker fit.

1.3.3.3 When the roadway is opened to traffic during non-working hours, the contractor shall not cut more slots than the number of markers that canbe installed in the same day.

1.3.4 The slot shall be clean and dry prior to applying the epoxy adhesive.

1.3.4.1 The slot shall be partially filled with epoxy adhesive, and the marker shall be placed in the slot with sufficient pressure applied to seat the casting. The leveling tabs shall rest on the pavement surface. The marker tips shall be slightly below the pavement surface. After seating the casting, the epoxy shall extrude to the pavement surface, completely filling all voids around and under the casting. There shall be no epoxy adhesive on the reflector.

1.3.4.1.1 For machine mixed epoxy adhesive applications, the adhesive shall be mixed and the markers shall be installed according to the marker manufacturer’s written instructions. Special precautions shall be observed to ensure that the epoxy adhesive has not cured excessively prior to placement of the marker in the slot. The manufacturer’s written installation instructions shall be readily available on the project during placement. At the beginning of each day, and at any other time directed by the engineer, the proportioning equipment shall be verified to determine if the actual volume ratio of the components is within the manufacturer’s requirements. This shall be accomplished by placing containers before the mixing chamber and the measurement of actual volumes of the components discharged. If volumes are not within the acceptable tolerance range, installation procedures shall be suspended until the contractor has corrected the equipment.

1.3.4.1.2 When hand mixing of epoxy adhesive is permitted, no more than 1 quart (liter) of epoxy adhesive shall be mixed at one time. The markers shall be installed within 5 minutes after mixing operations are started.

1.3.4.2 Additional epoxy adhesive shall be applied to the slot if the original amount does not sufficiently fill the slot after the marker is installed.

1.3.4.3 The epoxy adhesive shall cure within 30-45 minutes. If, after one hour, the epoxy adhesive can be penetrated by a screwdriver or other pointed instrument, the marker shall be removed, cleaned and reinstalled.

1.3.4.4 The installed marker shall be protected against traffic impact until the epoxy adhesive has hardened.

1.4 Method of Measurement. Measurement for the SRPM'S will be made per each.

1.5 Basis of Payment. The accepted quantity of snowplowable raised pavement markers will be paid for at the contract unit price for each of the pay items included in the contract. Payment will be considered full compensation for all labor, equipment and material to complete the described work.

2.0 REHABILITATION OF EXISTING SNOWPLOWABLE RAISED PAVEMENT MARKERS

2.1 Description. This work shall consist of rehabilitation of existing SRPM's including removing, furnishing and installing replacement reflectors or castings units as shown in the plans or as directed and approved by the engineer.

2.2 Materials. Replacement reflectors, castings, bonding agents, and other required materials shall meet the specifications for materials recommended by the SRPM manufacturer and shall be in accordance with Section 1.0.

2.3 Construction Requirements.

2.3.1 All work shall be performed in accordance with SRPM manufacturer recommended methods and procedures. The methods and procedures shall be approved by the engineer prior to beginning work.

2.3.2 Existing reflectors shall be removed without causing damage to the existing casting . The casting shall be thoroughly cleaned prior to installation of the reflector. The replacement reflector shall be securely bonded to the casting using a manufacturer approved bonding agent. Any castings damaged due to the contractor's operations shall be replaced at the contractor's expense.

2.3.3 All cracked, broken or missing castings shall be replaced. If the existing hole cannot be used, it shall be patched to the approval of the engineer and the new SRPM shall be installed approximately 2' (0.6 m) before or after the existing location in accordance with Section 1.3. All patched areas on bridge decks will be patched with epoxy.

2.4 Method of Measurement.

2.4.1 Measurement for replacement of snowplowable raised pavement marker reflectors will be made per each.

2.4.2 Measurement for replacement of SRPM's will be made per each.

2.5 Basis of Payment. The accepted quantity of replacement of snowplowable raised pavement markers and reflectors will be paid for at the contract unit price for each of the pay

items included in the contract. Payment will be considered full compensation for all labor, equipment and material to complete the described work.

3.0 PREQUALIFICATION AND PROJECT ACCEPTANCE

3.1 The engineer may have the SRPM's or reflectors inspected and sampled at the point of manufacture, at an intermediate shipping terminal or at destination. The engineer shall be allowed free access to all facilities and records as required to conduct inspection and sampling.

3.2 In order to become prequalified, the product shall have completed testing through AASHTO's National Transportation Product Evaluation Program (NTPEP). A written request shall be sent by the manufacture to the State Project Operations Engineer with the following information included in the request for prequalification:

(a) Brand name of the product.
(b) Actual test results from NTPEP.
(c) Certification that the material meets this specification and is intended for use as described.
(d) Specific installation instructions.

3.3 To become prequalified for MoDOT, for all NTPEP test decks, the SRPM's shall receive minimum average ratings for each of the SRPM components.

3.3.1 The casting shall receive a minimum average rating of 4.0 for housing performance and 3.0 for lens and visibility after one year exposure on both concrete and asphalt test decks.

3.3.2 The reflector shall receive a minimum average rating of 3.0 for lens and visibility after one year exposure on both concrete and asphalt test decks.

3.4 The contractor shall submit a manufacturer's certification for each lot of SRPM's or reflectors furnished with the name of the manufacturer, a certification statement that the SRPM's or reflectors supplied are the same as that prequalified, and the date of prequalification.

3.5 Acceptance will be based on the SRPM's or reflectors prequalified status, the manufacturer's certification that the SRPM or reflector supplied is the same as that prequalified and upon the results of such tests as may be required.

3.6 A retest on approved SRPM's and reflectors must be conducted if the configuration changes.